A.D. 1844 . . . . . N° 10,040.

SPECIFICATION

OF

EZRA JENKS COATES.

REDUCING FRACTURES AND DISLOCATIONS OF BONES, &c.

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COATES' SPECIFICATION.

TO ALL TO WHOM THESE PRESENTS SHALL COME, I, Ezra Jenks Coates, of Bread Street, Cheapside, in the City of London, Merchant, send greeting.

WHEREAS Her present most Excellent Majesty Queen Victoria, by Her Letters Patent under the Great Seal of Great Britain, bearing date at Westminster, the Eighth day of February, in the seventh year of Her reign, did, for Herself, Her heirs and successors, give and grant unto me, the said Ezra Jenks Coates, Her especial licence, full power, sole privilege and authority, that I, the said Ezra Jenks Coates, or such others as I, the said Ezra Jenks Coates, my exors, admors, or assigns, should at any time agree with, and no others, from time to time and at all times during the term of years therein expressed, should and lawfully might make, use, exercise, and vend, within England, Wales, and the Town of Berwick-upon-Tweed, and in the Islands of Jersey, Guernsey, Alderney, Sark, and Man, and in all Her Majesty's Colonies and Plantations abroad, the Invention of "Improvements in Apparatus for Facilitating the Reduction of Fractures and Dislocations of Bones, and for Maintaining the Parts in their Just Position, communicated to me by a certain foreigner residing abroad;" in which said Letters Patent is contained a proviso, that I, the said Ezra Jenks Coates, shall cause a particular description of the nature of the said Invention, and in what manner the same is to be performed, to be enrolled in Her said Majesty's High Court of Chancery within six calendar months next and immediately after the date of the said in part recited Letters Patent, as in and by the same, reference being thereunto had, will more fully and at large appear.

NOW KNOW YE, that in compliance with the said proviso, I, the said Ezra Jenks Coates, do hereby declare that the nature of the said Invention, and the manner in which the same is to be performed, are fully described and ascertained in and by the following statement thereof, reference being had to the Drawings hereunto annexed, and to the figures and letters marked thereon, that is to say, I denominate the said machine or apparatus "the adjuster." The Drawings accompanying the following Specification are referred to therein, and constitute a part thereof.

The first portion of the machine may be termed the case; its form is exhibited at B in one of the Drawings. It may be constructed of any suitable material, such as wood, brass, or iron; but brass is supposed to be the best. It may be cast (if of brass), about one-eighth of an inch in thickness and twelve inches in length, the edges being turned at right angles with the plate, and prejecting therefrom about one-fourth of an inch, as seen at *k*, *k*, the case being about one and one-fourth of an inch wide, except at one end, where a pinion wheel, marked D in the Drawing, is to be fitted, the case at this end being formed a little wider, or so as to correspond with the said pinion wheel, as represented in the Drawings. A cap E is to be secured to the case by screws passing through screw holes (marked *m*, *m*, *m*, &c.) in the cap, and *n*, *n*, *n*, &c. in the case. The case should be about one-half an inch in thickness, and its interior should be divided longitudinally by a partition *h*; thus, the edge *k* of the case, the partition *h*, the bottom of the case, and the cap E form the four sides of a passage or way for the reception and movements of the rack C, to be hereinafter described. The opposite edge of the case, the partition *h*, bottom of the case, and cap thereof constitute the four sides of another passage for the reception of the screw *f* of the fork A, to be herein-after described, the said screw *f* moving or working in a female screw cut in the end of the passage, or at *g*, the said end being suitably formed for the purpose. At or near the opposite end of the case a pinion wheel D is to be arranged as seen in the Drawing, and so that its teeth shall engage with those of the rack C. A ratchet wheel (F) fixed upon the shaft G of the pinion D is arranged on the exterior of the plate or cap of the case, and has a catch or a dog H connected with it, the same catch turning on a fulcrum or pin, and being pressed against the ratchet wheel by a spring *q*, suitably arranged. The shaft G projects a short distance beyond the face of the ratchet wheel, and is formed square, or in any other proper shape, to receive upon it or to enter within the head or end of a key lever I. The said lever may be about six inches in length, its end having a suitable mortice or orifice formed in it, so that it may be applied to the projecting end of the pinion shaft, and removed therefrom at pleasure.

The second portion of the apparatus may be denominated the fork. It is represented at A in the Drawing. It may be made of any form, and suitable metal, but steel is supposed to be the best. Its arms (marked *a*, *a*,) consist of a thin plate of such metal, about three-fourths of an inch wide, and long enough to extend a little more than half around the upper part from the inside of the thigh; and at the same time each arm, the one forward and the other backward, rises by a gradual curve, until the ends of the arms reach an imaginary transvere line crossing the os ilium. The curve and form of the arms are particularly represented in the Drawings. The said arms should stand at such a distance from each other as to readily and easily incompass the part to which they may be applied, and their ends should each terminate in a rectangular notch, as seen at *c*, *c*. A small and flat button *b* should be attached to the outer side of each arm and near the extremity thereof. A screw *f* should project from the point of union of the two arms, and should extend in nearly an opposite direction to that of the arms. The length of this screw may be about two inches; its object is to diminish or extend the length of the instrument, and to allow a free rotary motion to the case, or what in other words may be termed a transverse movement of the said case upon the screw, in order to readily adapt the apparatus to the dislocated limb. From the extremity of the screw shank, where it is attached to the arms, a small pin *d* projects about one-fourth of an inch, the curve K, to be herein-after described, being placed upon this pin by inserting the pin in a corresponding hole *e*, formed through the covered piece of metal K.

The third member of the apparatus, which I have herein-above denominated as the cure, consists of a piece of metal bent into a parabolic form, or nearly so, and having its ends about one inch in breadth, and terminating in rectangular notches, as seen at *c*, *c*. Each end has a small button *b* attached to its exterior surface, as seen in the Drawing. A hole *e* is formed through the central part of the curve K to admit the pin *d*, which projects from the top of the screw of the fork A.

The fourth member of the apparatus is the rack bar, which is represented in the Drawing at C. It may be constructed about one-half an inch in width, and one-fourth of an inch in thickness; in length it should be about thirteen inches between its extremity of *i* and the land or angle of the foot of the point *o*; teeth to match with those of the pinion D are to be formed on its edge. From the angle or bend at *o* (which should be a right angle or thereabouts) to the end *p* a distance of about four and one half inches should intervene, the bent end or part of the rack extending in the direction denominated by the Drawing. This bent end may be termed the foot of the rack.

The fifth part of the apparatus I denominate the transvecture. It consists of three separate parts, as seen at P, Q, and R, in the Drawings. That represented at P is a lever, about fourteen inches in length, and of a curved form; it has a pin (*u*) attached to one end of it by a hinge joint (*v*), the said pin being about one and one-half in length, and terminating in a screw, upon which is to be screwed the femoral plate R, a screw hole *w* being formed through the centre of the said plate. This plate is about six inches in length, one and one-half inches in width, and of the proper thickness and curve to fit the inside of the thigh. At about two and one-half inches from the hinge joint on the lever P the fulcrum Q is to be attached by a joint which will permit of the requisite movement of the lever in a direction from or towards the case B. The said falcrum should be so fitted to the case B that it may be slipped upon or off the same at pleasure, and when on that it may hold the transvecture firmly to the case. The tranvecture is intended to produce lateral or transverse motion, at the option of the operator, who produces the same by the application of his own hand or that of an assistant to the leaver P.

The sixth part of the apparatus I denominate the tibia fork, the same being represented at T in the Drawing. It may be of the same material as the fork; it should have a short screw (one and one-half inches long, or thereabouts), fastened to it at right angles with the arms or steel plate constituting the fork, the same being as represented in the Drawing. In its form this plate is simicircular, its width being about one-half an inch, and its length that of the semicircumfrance of a circle six inches diameter. The screw should be cut with the same size of thread and of the same diameter as the screw *f*, before described. The tibia fork is intended to be used (instead of the fork) in all fractures and dislocations occuring below the knee joint, and when used its constitutes the point of counter-extension of the instrument.

The seventh part of the apparatus, which I call the brachi fork, is seen in Plate 2 at U. It should consist of a screw (about one and one-half inches in length, and having the same diameter and thread as the screw *f* before described has), terminating, as seen in the Drawing, in a shank or stem about about three and one-half inches in length, whose extremety, or where it is united to the screw, is bent, or stands divergent from the axis of the screw, as represented in the Figure. From the other end of the stem, and at a right angle with it, a curved bar of metal should extend in the form of a semicircle of about four inches in diameter. The bachi fork is intended to be used instead of the tabia fork in most cases of fracture or dislocation occurring below the condyles of the os humerii. For such purposes it is to be connection with the case B by inserting its screw in the end thereof, or in the screw

hole of the screw *f*, and where thus employed it constitutes the counter-extending point of the instrument. When in use the case B lies on the front of the fore arm, the curve of the bachi fork passing around the back of the arm, and close to the condyles at the elbow joint.

The eighth part of the apparatus may be denominated the straps or rolls, of which there should two, viz., one for the fork A and the other for the curve K. They may consist of leather, cloth, or any other suitable strong and pliable material, covered with some soft fabric, such as velvet or Canton flannel. They should be made hollow, and stuffed with some elastic substance (curled hair being supposed to be the best), leaving the ends of the roll L free thereof for some distance for a number of small button holes to be made therein, for the purpose of fastening or buttoning the same over the buttons *b*, *b*, before mentioned, each end of the roll M having a button hole formed in it. The roll L is to be applied to the fork A at the ends of the arms *a*, *a*, thereof, and should be long enough to hang between them, as seen in Plate 2; the roll M is applied to the curve K in a similar manner or as seen in the Drawing thereof in Plate 2. The afore-mentioned rolls, when both are used, form the counter-extending point of the instrument when the parts to which they separately belong are also used.

The ninth part of the apparatus I term the belts, of which there should be two, as denoted at N and O in the Drawing. The one at N should be fitted to firmly clasp the thigh close to and above the condyles of the os femoris, or the arm close to, and the os humeri. The other belt, videlicet O, should be made on the same principle, and to fit the ancle above and close to the mallcolus processes, or the fore arm of the wrist. The loops, which are shewn at *z*, *z*, &c. may be of iron, cloth, or any strong and suitable material, and fastened firmly to the belts in the positions as seen in the Drawings. The said loops are to be connected to the foot *p* of the rack C by strong cords passing through the loops and over the foot *p* and made fast thereto.

The tenth part of the apparatus is simply a strap of leather or cloth, having a loop at one end to slip into the arm of the fork, and a buckle attached at or near the middle of it; a series of holes is punctured through the other end or part of the strap for the tongue of the buckle to pass through in the ordinary manner. When this strap is in use, it passes over the dorsum ilii, and confines the arms of the fork outward. It is represented at S in the Drawing. The following is the mode of using the above-described apparatus. It is believed that a description of the manner of employing it in two dislocations (videlicet, one of the hip joint and the other of the elbow joint,) and in two fractures (videlicet, one of the thigh bone, and the other of the leg bones,) will be

sufficient explanation for all who are acquainted with the science or practice of surgery.

First, for a dislocation of the thigh bone upward and outward the head of the bone, and the trochanter resting on the dorsum of the ilium.—Let the several parts of the apparatus be combined together as represented in Plate 2. This being accomplished, next let the belt N be buckled around so as to clasp the thigh firmly above and close to the condyles of the thigh bone, the loops of the belt standing towards the knee joint, one being on either side of the limb and strong cords being passed through them. Now let the roll L be applied closely in the angle between the perinæum and inside of the thigh, the arms of the fork, the one forward and the other backward, reaching nearly as high as the top of the os ilium; fasten the strap S to the arms crossing the dorsum of the os ilium so as to confine the arms outward; fasten the loops by the cords already passed through them to the foot of the rack. Now let a common handkerchief, or anything convenient for that end, be passed around the limb and instrument close to the knee, and then tied, in order to confine the instrument to the limb; let the leg be bent at right angles with the thigh, and the thigh placed in a line with the body; next cause an assistant to take hold with one of his hands of the limb to be operated upon, at the foot thereof, and with the other hand at the knee thereof, another assistant having hold of the lever of the transvecture; let the operator now apply one of his hands to the lever I and elongate the limb (by moving the said lever) until with the other hand he feels the round head of the femor descend to a transverse line with the acetabulum; now let the assistants (the one having hold of the lever P and the other of the limb) operate simultaneously, the one by means of the lever P casting the limb outward from the body, and the other by throwing the foot inward and the knee outward, so as to rotate the thigh on its own axis. The operator now finds the head of the bone directly over the acetabulum, into which he restores it (if need be) by gently pressing with the hand on the trochanter major, while extension in the limb is gradually relaxed.

Second, to reduce and treat in the bent position an oblique fracture of the thigh bone (os femoris).—Let the transvecture be removed from the case and place the curve K on the pin *d*; apply and fasten the instrument as before described, except that the handkerchief may be dispensed with. Now place the limb (having the instrument affixed to it) upon a double inclined plane, provided with the necessary bandages; let the operator extend the limb (by turning down the lever I, as before described,) until a just co-aptation of the ends of the bones may be readily effected by him; apply the proper splints, bandages, &c., agreeably to approved methods in surgery), and keep up such

an extension of the limb as will preserve its due length, and relieve it from any attending spasmodic contractions; lastly, remove the instrument when no longer necessary for either purpose.

Third, to apply the apparatus when the straight position of the limb is to be preserved, it is only necessary to elongate the instrument by running out the screw of the fork and the rack sufficiently to adapt the length of the apparatus to that of the limb. The bent end of the rack or point of extension should be made fast by cords to the belt buckled around the ancle, the said end extending beneath the foot, the counter-extending point or other end of the apparatus being applied, as before mentioned and described, in the angle between the perinæum and thigh. Two long splints (one long enough to reach from the perinæum to the sole of the foot, the other from the top of the os ilium to the sole of the foot, and each about two and one-half inches wide, and about one-third of an inch thick), are to be folded in a cloth of cotton or flannel, so as to form a casement or box for the limb to be laid in. The "adjuster" is to be applied and made fast after the limb is laid in the above encasing or box. Now let the operator extend the limb as before to effect co-aptation; let the adjuster and splints be now tied firmly together, by passing two tapes (one above and the other below the knee) around the limb, and tyeing them strongly thereto.

Fourth, to reduce and treat an oblique fracture of the leg wherein strong muscular contractions are to be overcome.—In order to avoid danger to the patient or deformity of the limb, apply and fasten the belt N immediately below the knee and around the leg, also the belt O to the ancle, as before; remove the fork A from the case and insert the tibia fork in its place; slip the arms of the tibia fork through the loops of the belt N, and fasten by strong cords the loops of the belt O to the foot of the rack below the sole of the foot. The limb should now be placed on the double inclined plane, as before described, the proper bandages being previously laid on the plane. This being accomplished, the operator is to lengthen the limb to its due extent by turning the lever I, so as to throw or extend the rack from its case. Let the surgeon adjust the fractured bones, and dress with splints, bandages, &c. in the most approved manner, at the same time maintaining such extension of the limb (by the adjuster) as will be necessary to relieve undue muscular contraction, and preserve the proper length of the limb.

Fifth, to reduce a dislocation of the elbow joint, where the coronoid process of the ulna lies in the posterior fossa of the humerus.—For the reception of the olecranon process of the ulna, remove the tibia fork from its case, and insert the brachi fork in its stead, and run the rack so far within the case that the

instrument at least shall be as long as the fore arm and hand combined; buckle the belt N around the arm and close to the condyles of the humerus, the loops thereof being on the back of the arm, and close to and immediately above the olecranon process of the ulna; also buckle the belt O around the wrist, so that the loops of it (having strong cords passed through them) shall lie the one on the front and the other on the back of the wrist. Now let the curve of the brachi fork be passed through the loops (of the belt N) on the back of the arm. The case now lying on the front of the fore arm, let the foot of the rack be closely fastened to the wrist by means of the cords of the loops of the belt O; now let the operator by a gradual and steady motion so far throw the rack out that the coronoid process of the ulna may ride over and lie in front of the pulley-like surface of the humerus, as he performs the necessary fluxion of the fore arm, in order to bring the process into its place.

The Invention herein-above described is believed to differ from all others (heretofore known and used) in several important particulars, to wit:—In the use of the lever, pinion, and rack, to produce extension and counter-extension, and the use of the transvecture to produce lateral or transverse motion in reducing dislocations and fractures of bones; also, in the use of a ratchet wheel and dog or catch to maintain such extension and counter-extension; also, in such an arrangement or combination of the screw and rack in one case that the apparatus may be readily adjusted to any length or position of limb, and adapted to reduce any form of fracture or dislocation of any of the (so called) long bones, and many others, indeed all where the principle of extension and counter-extension apply to their reductions.

Having thus explained the Invention, I declare that I claim the combination of the rack bar and screw, or other contrivances of similar character, in and with one case, the whole being arranged and operating in connection with the forks, rolls, belts, &c. applied thereto and used therewith, substantially in the manner and for the objects as herein-before set forth; also, the combination with the case or apparatus of similar character of the transvecture, or any instrument of like description, for the purpose of producing lateral or transverse motion, in the manner as herein-before specified, the said transvecture being constructed and applied substantially as represented in the Drawings, and as herein-before explained.

In witness whereof, I, the said Ezra Jenks Coates, have hereunto set my hand and seal, this Sixth day of August, in the year of our Lord One thousand eight hundred and forty-four.

E. J. (L.S.) COATES.

AND BE IT REMEMBERED, that on the Sixth day of August, in the year of our Lord 1844, the aforesaid Ezra Jenks Coates, Esqre, came before our said Lady the Queen in Her Chancery, and acknowledged the Specification aforesaid, and all and every thing therein contained and specified, in form
5 above written. And also the Specification aforesaid was stamped according to the tenor of the Statute made for that purpose.

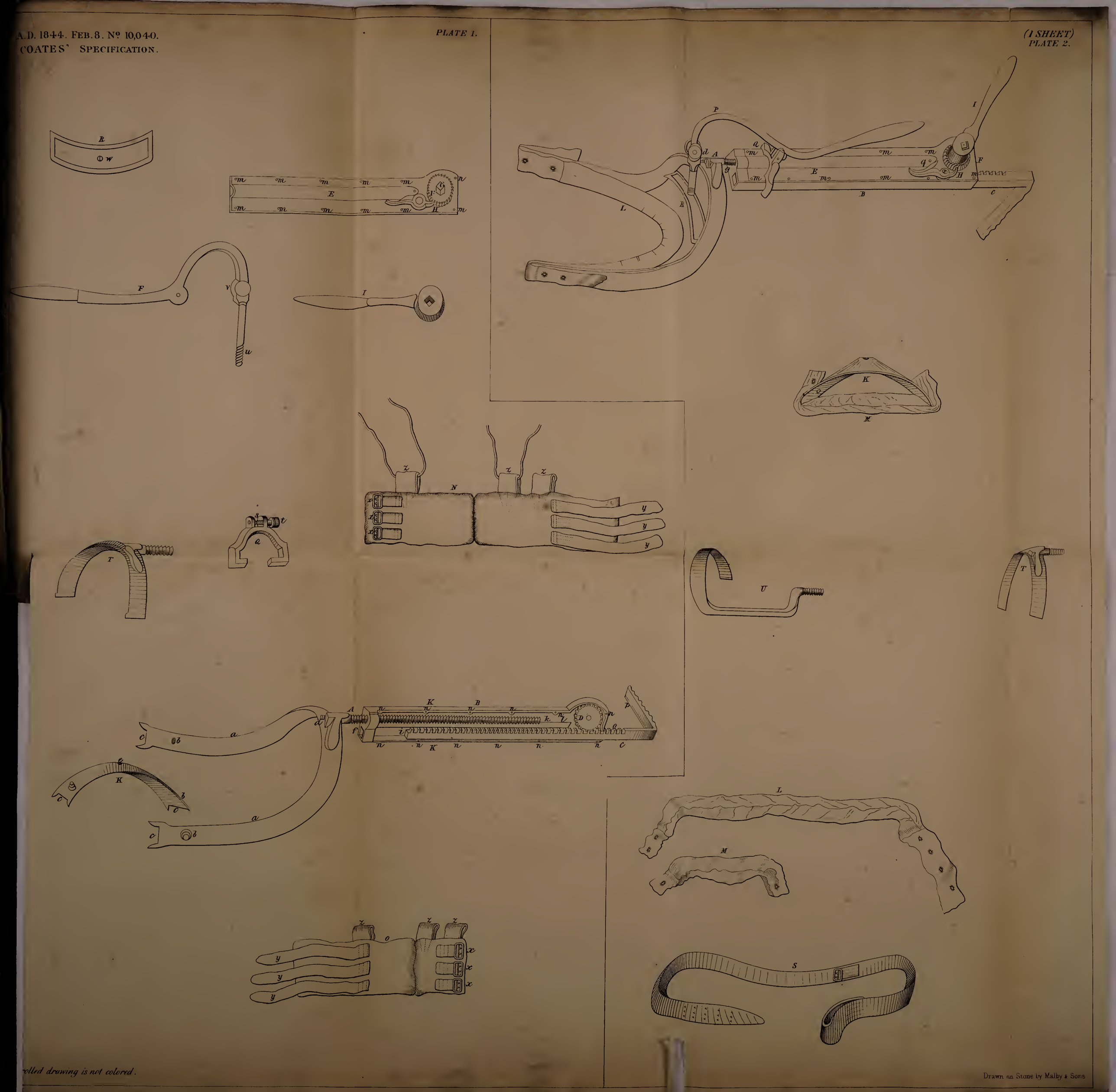
Enrolled the Eighth day of August, in the year of our Lord One thousand eight hundred and forty-four.

LONDON:
Printed by GEORGE EDWARD EYRE and WILLIAM SPOTTISWOODE,
Printers to the Queen's most Excellent Majesty. 1856.

A.D. 1844. Feb. 8. Nº 10,040.
COATES' SPECIFICATION.

PLATE 1.

(1 SHEET)
PLATE 2.



Rolled drawing is not colored.

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